

S&T Campaign: Materials Research
*Photonics, Electronics, Energy & Power,
Bio & Bioinspired, Quantum Sciences*

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Research Objective

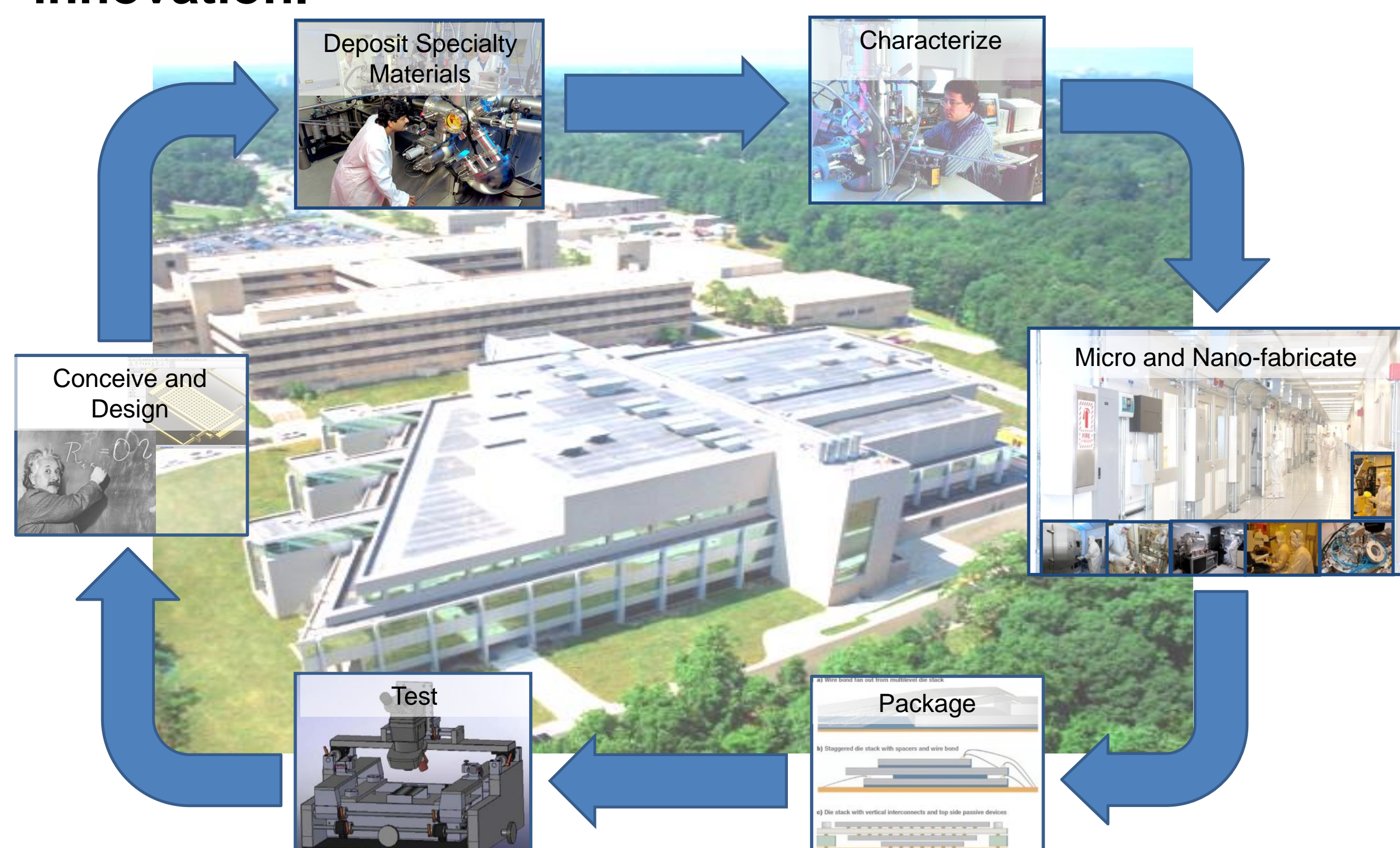
- Spearhead research into innovative materials, devices, and high risk processing techniques
- Expand research in nanoscience, MEMS, electronics, power generation and opto-electronics
- Support ARL researchers, stimulate collaboration, and foster MEMS and Nanotechnology development with industry & academia



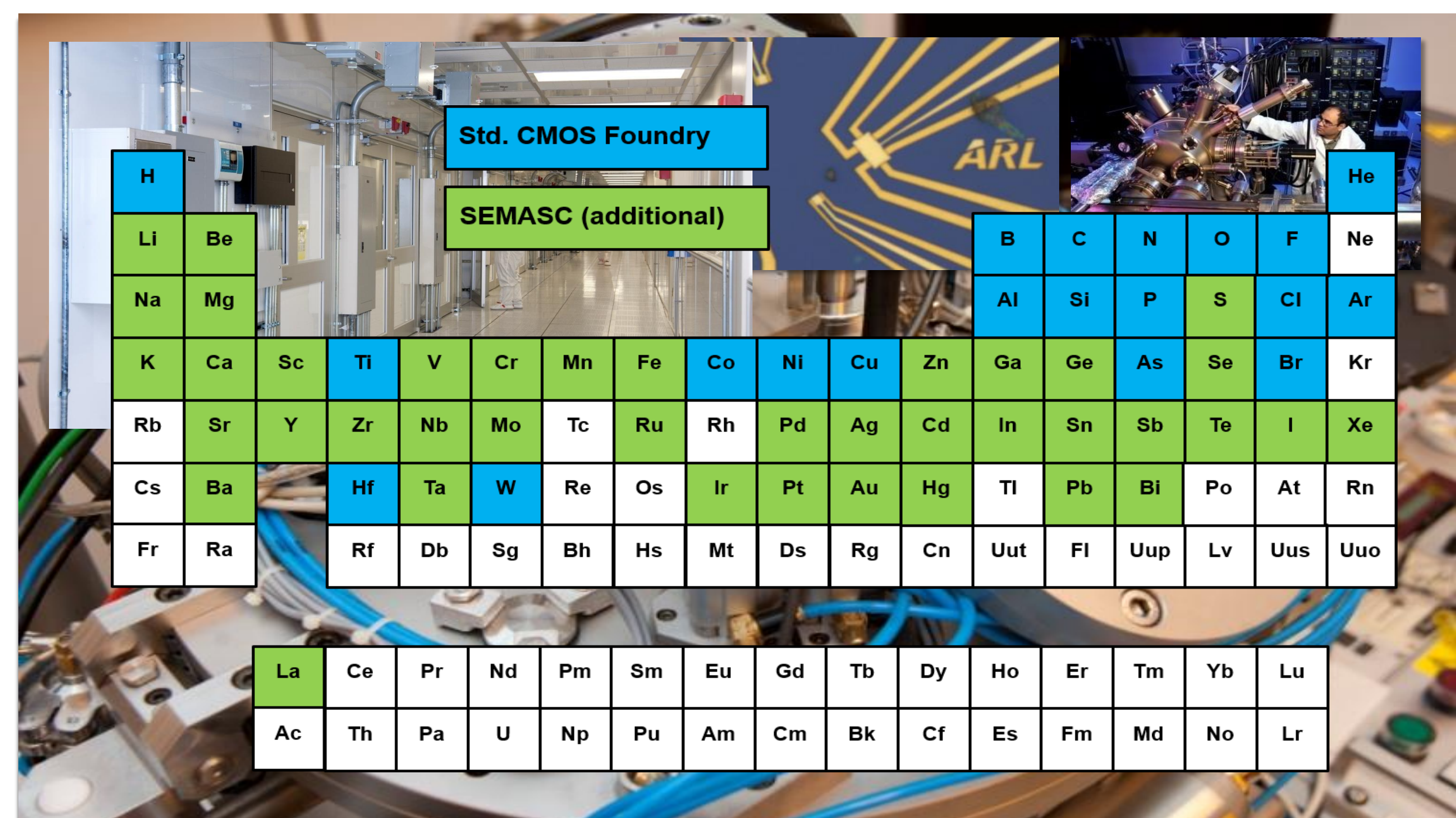
15,000 sq ft facility populated with 67 processing tools representing ~\$40M investment

Challenges

- Enable researchers to work with as diverse a materials set as possible.
- Ensure state of the art Micro- and Nano-fabrication capabilities to provide design freedom in device scales and geometries possible.
- Provide researchers hands-on process access to explore the interplay between device design and processing.
- Provide straightforward intellectual property sensitive access for private sector organizations to support innovation.



Highly versatile and unique toolset combined with a very flexible materials policy allows rapid prototyping and fast R&D



Range of materials processed in Center facilities

Unique Strengths

- Support duplicate process platforms to allow verification of new materials without impacting with other research.
- Focus on novel process technologies and materials
 - 2-D materials (Graphene, MoS2)
 - Piezoelectric materials for RF MEMS and micro-robotics
 - Multi-layer copper for microscale power conditioning
 - UV sources and detectors
 - IR focal plane arrays
 - Fuel reformation membranes
 - High current electronics for ubiquitous power
- Turnkey research capability - concept through tested device under one roof
- Access to Army requirements and transition partners.

ARL Facilities and Capabilities Available to Support Collaborative Research

- Broad experience and facilities supporting diverse research in opto-electronics, nanoscience, MEMS, electronics, microscale power systems and beyond.
- Application, design, fabrication and materials expertise.
- Expansive capabilities for depositing and micromachining heterogeneous electronic materials.
- Facilities for unique materials deposition (including MBE, MOCVD, ALD, PECVD, CVD, sputtering, evaporation, sol-gel, spin casting, jet vapor etc.)

Cleanroom capabilities include:

- Lithography (**Laser direct write***, E-beam, Contact, Mask making, Resist processing)
- Deposition (**ALD***, PECVD, **Evaporation***, Sputtering, Sol Gel)
- Etching (**ICP***, RIE, Plasma, ISM, Bosch, Ion Milling, Vapor Phase, Wet)
- Thermal (Oxidation, **Anneal***, Bonding, RTA)
- Metrology (SEM, Optical Inspection, Film thickness, Film stress, Topography mapping, Electrical characterization)
- Broad packaging capabilities including **vacuum packaging***, dicing, wirebonding, pick-and-place, flip-chip bonding, parylene deposition, and 3D-printing

* **Unique tool capability and/or process expertise**